

# B.S. IN COMPUTER ENGINEERING - SOFTWARE ENGINEERING OPTION

Software Engineering is concerned primarily with the systematic and disciplined approach to developing software systems. It requires the application of both computer engineering and computer science principles and practices to the creation, operation, and maintenance of software systems and applications. The Software Engineering Option of the Bachelor of Science in Computer Engineering degree at the University of Miami is a unique interdisciplinary program developed and administered collaboratively by the Department of Electrical and Computer Engineering and the Department of Computer Science.

This Option prepares students for successful careers in software engineering. Software systems are becoming increasingly complex, and emerging technologies are pushing the boundaries of reusable components and software quality assurance. To prepare students to meet these challenges, this Option establishes a solid foundation of software system fundamentals, coupled with strong hands-on experience and an understanding of professional practice and conduct.

In addition to the core curriculum in software engineering, students are introduced to the paradigms of real-time, adaptive, and collaborative software systems, through a wide range of technical elective courses from both the Department of Electrical and Computer Engineering and the Department of Computer Science. Students may also use courses from other departments with academic advisor approval. The technical electives allow students to apply the knowledge they have gained to different application areas. This provides valuable hands-on experience in contemporary application areas, which enhances the students' potential career development opportunities.

Students pursuing the Software Engineering Option of the Bachelor of Science in Computer Engineering degree must earn at least 15 credit hours in Computer Science as part of their degree requirements.

## Curriculum Requirements

Code	Title	Credit Hours
<b>Common Engineering Requirements</b>		
ECE 111	Introduction to Engineering I	3
ECE 112	Introduction to Engineering II	2
ECE 118	Introduction to Programming	3
ECE 201	Electrical Circuit Theory	3
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 211	Logic Design	3
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 218	Data Structures	3
ECE 315	Digital Design Laboratory	1
ECE 316	Structured Digital Design	1
ECE 318	Algorithms	3
ECE 322	Systems Programming	3
ECE 414	Computer Organization and Design	3
ECE 417	Embedded Microprocessor System Design	3
ECE 481	Senior Project I	1
ECE 482	Senior Project II	2
<b>Engineering and Technical Electives</b>		
ECE 412	Software Engineering and Architecture	3
ECE 413	Software Design and Verification	3
ECE 421	Computer Operating Systems	3
or CSC 421	Principles of Computer Operating Systems	
ECE 467	Database Design and Management	3
or CSC 423	Database Systems	
ECE 470	Network Client-Server Programming	3
SE Technical Electives		9
<b>Other Courses</b>		
<b>Computer Science Credit Hours</b>		

CSC 317	Data Structures and Algorithm Analysis	3
CSC 419	Programming Languages	3
<b>Math &amp; Basic Science Credit Hours</b>		
ECE 310	Introduction to Engineering Probability	3
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 309	Discrete Mathematics I	3
PHY 221	University Physics I	3
PHY 222 or PHY 223	University Physics II University Physics III	3
PHY 224 or PHY 225	University Physics II Lab University Physics III Lab	1
Basic Science Elective		3
Basic Science Elective + Lab		4
<b>General Education Credit Hours</b>		
ENG 105	English Composition I	3
ENG 107	English Composition II: Science and Technology	3
Arts and Humanities Cognate		9
People and Society Cognate		9
<b>Total Credit Hours</b>		<b>127</b>

## Suggested Plan of Study

Course	Title	Credit Hours
<b>Freshman Year</b>		
<b>Fall</b>		
ECE 111	Introduction to Engineering I	3
ECE 118	Introduction to Programming	3
ENG 105	English Composition I	3
MTH 151	Calculus I for Engineers	5
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
ECE 112	Introduction to Engineering II	2
ECE 218	Data Structures	3
ENG 107	English Composition II: Science and Technology	3
MTH 162	Calculus II	4
PHY 221	University Physics I	3
<b>Credit Hours</b>		<b>15</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
ECE 211	Logic Design	3
ECE 318	Algorithms	3
MTH 210	Introduction to Linear Algebra	3
PHY 222 or 223	University Physics II or University Physics III	3
PHY 224 or 225	University Physics II Lab or University Physics III Lab	1
Arts and Humanities Cognate <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
ECE 201	Electrical Circuit Theory	3
ECE 212	Processors: Hardware, Software, and Interfacing	3

ECE 310 or IEN 310	Introduction to Engineering Probability or Introduction to Engineering Probability	3
ECE 315	Digital Design Laboratory	1
MTH 309	Discrete Mathematics I	3
People and Society Cognate <sup>1</sup>		3
	<b>Credit Hours</b>	<b>16</b>
<b>Junior Year</b>		
<b>Fall</b>		
ECE 202	Electronics I	3
ECE 203	Electrical Circuits Laboratory	1
ECE 322	Systems Programming	3
ECE 412	Software Engineering and Architecture	3
ECE 414	Computer Organization and Design	3
Arts and Humanities Cognate <sup>1</sup>		3
	<b>Credit Hours</b>	<b>16</b>
<b>Spring</b>		
ECE 316	Structured Digital Design	1
ECE 413	Software Design and Verification	3
ECE 421 or CSC 421	Computer Operating Systems or Principles of Computer Operating Systems	3
ECE 467 or CSC 423	Database Design and Management <sup>2</sup> or Database Systems	3
Basic Science Elective <sup>1</sup>		3
Basic Science Lab Elective <sup>1</sup>		1
People and Society Cognate <sup>1</sup>		3
	<b>Credit Hours</b>	<b>17</b>
<b>Senior Year</b>		
<b>Fall</b>		
ECE 417	Embedded Microprocessor System Design	3
ECE 481	Senior Project I <sup>3</sup>	1
CSC 317	Data Structures and Algorithm Analysis	3
SE Technical Elective <sup>1</sup>		3
Basic Science Elective		
Arts and Humanities Cognate <sup>1</sup>		3
	<b>Credit Hours</b>	<b>13</b>
<b>Spring</b>		
ECE 470	Network Client-Server Programming	3
ECE 482	Senior Project II	2
CSC 419	Programming Languages	3
SE Technical Elective <sup>1</sup>		3
SE Technical Elective <sup>1</sup>		3
People and Society Cognate <sup>1</sup>		3
	<b>Credit Hours</b>	<b>17</b>
	<b>Total Credit Hours</b>	<b>124</b>

<sup>1</sup> See description of electives under the Departmental Electives Section.

<sup>2</sup> With advisor approval.

<sup>3</sup> Offered only in the Fall semester.

\* **Students must earn at least 15 credit hours in Computer Science (CSC)**

\*\* **Students must have at least 32 credit hours of Math and Science**

## Mission

The mission of the Department of Electrical and Computer Engineering is to achieve and maintain, through a continuous improvement process, excellence in undergraduate and graduate education, research, and service to the community and the nation. We endeavor to accomplish this by providing high-quality education and research programs which will impart the requisite knowledge and skills to our students enabling them to assume leadership roles in contributing to the advancement of the underlying electrical and computer engineering technologies which sustain the current world economy, to promote a strong commitment to life-long learning, to prepare them for a variety of alternative career paths and to participate as responsible citizens in a rapidly changing and shrinking global community.

## Program Educational Objectives

We expect that the alumni of the Computer Engineering Program will exhibit the following:

1. Successful careers in dynamic and multidisciplinary fields with the ability to apply computer engineering practices within societal, global, and environmental contexts in an ethical manner.
2. Demonstrating life-long learning through activities such as completion of graduate degrees and/or professional development.

## Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.